

- b) desorbing the adsorbed CO₂ by establishing a pressure gradient and gradually lowering the pressure in the adsorption zone to recover the CO₂ at the adsorption zone inlet;
 - c) raising the pressure of the adsorption zone by introducing a stream of pure gas via the adsorption zone outlet.
- 10. (Previously Pending) Process according to Claim 1, wherein the gas is air.
 - 11. (Previously Pending) Process according to Claim 3, wherein the process is performed by pressure temperature swing adsorption (PTSA).
 - 12. (Currently Amended) Process according to ~~claim~~ Claim 8, wherein the drying-agent contains alumina.
 - 13. (New) Process for the decarbonation of gas flows, contaminated with CO₂, comprising placing in contact the gas flow to be purified, in an adsorption zone, with at least one adsorbent consisting essentially of a zeolite containing NaLSX type with an Si/Al ratio of 1 to 1.15, exchanged with sodium to a degree of greater than or equal to 98%, the degree of exchange being expressed as the ratio between the number of sodium ions and the number of aluminium atoms in a tetrahedral position, the remainder of the exchange capacity being occupied by potassium ions, agglomerated with a binder, the content of residual inert binder in the adsorbent being less than or equal to 20% by weight whereby adsorption capacity gain is greater for partial pressures of CO₂ of about 2 mbar or less compared to greater such pressures of 5 mbar or more.

REMARKS

Claims 1-12 are pending in the application. Claims 1, 5, 6, 8, 9 and 12 have been amended. Claim 13 has been added. Support for the amendments to Claims 1, 8 and 13 are found on pages 9 and 10 of the present specification. The amendments to the remaining claims are formal in nature. No new matter is involved. Entry is requested.

Claims 5-9 and 12 have been rejected under 35 U.S.C. 112, second paragraph, as being indefinite. Applicant traverses this rejection.

Claims 5, 6, 8 and 9 have been amended in accordance with the comments set forth in the Office Action. The changes are formal in nature, essentially being directed to antecedent basis comments. The term "type" found in the original claims has been inserted where previously deleted. Claims 7 and 12 now depend from parent claims that are not indefinite.

For these reasons, Applicant respectfully submits that the rejection has been overcome and should be withdrawn.

Claims 1-12 have been rejected under 35 U.S.C. 103(a) as being unpatentable over European reference (EP0718024 A2) in view of European reference (EP0294588 A2). Applicant traverses this rejection.

New Claim 13 recites that the adsorption capacity gain is greater for partial pressures of CO₂ of about 2 mbar or less compared to greater such pressures of 5 mbar or more. This recited feature resulting from the process limitations recited in the claims is not taught in the references applied in the rejection. This recitation emphasizes the novelty set forth in Claims 1-12 which effect surprising increase in adsorption capacity gain relative to partial pressure of CO₂.

Applicant refers the examiner to the discovery only recognized by Applicant and set forth for example on pages 9, 10 and 11 of the present specification. Example 1 shows in Table 1 that for the degree of sodium exchange greater than 98%, a gain in terms of capacity greater for low pressures than for high pressures:

Table 1

Degree of sodium exchange	Pressure		
	2 mbar	5 mbar	10 mbar
94.5%	25	37.2	45.5
97.5%	29.2	40.3	47.8
99.5%	32.5	42	49

This discovery is not taught in the applied prior art. Little gain is shown for pressures of 5 mbar or 10 mbar.

Applicant further refers the examiner to a similar exemplification in Table 2:

Table 2

Degree of sodium exchange	Pressure		
	2 mbar	5 mbar	10 mbar
94%	30	43.4	53.5
97.5%	35	47	56
99%	38.5	49	58

The above Tables 1 and 2 from examples 1 and 2 of the specification teach a nonobvious discovery not taught in the above applied prior art.

Applicant points out that this feature is further emphasized in the present specification, page 3, first full paragraph. Applicant also points out on page 2, third full paragraph, that the secondary reference in the applied rejection is considered in the background of the invention prior to the description of Applicant's invention and prior to the commentary of the discovery noted above.

In the paragraph bridging pages 2 and 3 and in the first full paragraph on page 3, Applicant discusses US patent No. 5,531,808, which is the US counterpart of the applied

European publication used as the primary reference. The specification teaches on pages 2 and 3:

US patent No. 5,531,808 (02.07.96) discloses the teaching that CO₂ can be adsorbed very effectively using a zeolite of type X with an Si/Al ratio of less than 1.15. The advantage over “standard” zeolite X lies in the fact that it is no longer necessary to reduce the temperature in the decarbonization step using a cold unit since the efficacy of the zeolite is such that the selectivity for CO₂ over nitrogen remains high even up to 50° C.

It is observed that the capacity of a zeolite NaLSX to adsorb CO₂ increases as the level of exchange with sodium increases. However, it is also observed that the gain in efficiency begins to reach a plateau when exchange rates of about 90% are reached, such that there is apparently no further advantage in forcing the exchange beyond 95%. It has just been observed that this is only true for the process performed under relatively high partial pressures of CO₂: a very substantial gain in efficiency can be obtained for the decarbonization under low partial pressures of CO₂, of about 2mbar, with zeolites LSX in which the degree of exchange with sodium (defined as the molar ratio between sodium ions and the aluminium atoms in a tetrahedral position, the remainder being potassium) is at least 98%.

These novel discoveries are not taught in the applied primary reference. The plateau is a development observed by Applicant and not mentioned in the applied art.

Claim 7 emphasizes another nonobvious feature of the present invention. It recites that adsorbent is regenerated at a temperature of 100 and 120° C. This advantageous feature of the invention is set forth on page 7, lines 4-11, of the present specification. There it is pointed out that the known art employs higher temperatures of 130 and 170° C which makes it necessary to heat the adsorbent and increases the cost of the industrial plant.

The Office Action discusses a mechanical approach summarizing the disclosure of the applied references. However, the summary of the disclosure reflects as on page 3 of the EP ‘024 references broad disclosure about catalysts, pressures, temperatures, and in

general processing parameters which would not lead a person of ordinary skill in the art to the particular discovery uncovered only by Applicant and recited in the claims. To allege discovery of Applicant's invention from such broad disclosures is akin to discovery of a combination of a safe from an inspection of its dial.

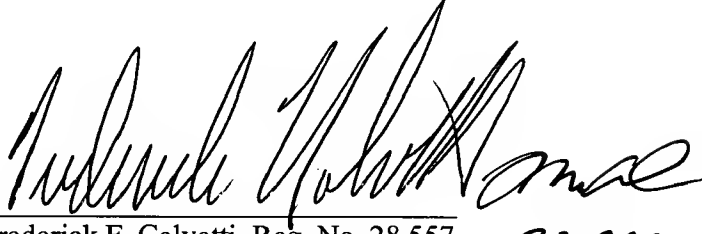
Applicant points out that Claim 13 emphasizes the invention. It does not narrow the breadth of Claims 1-12 which recite features that effect the whereas clause found at the end of Claim 13.

For these reasons, Applicant respectfully submits that the rejection is in error and should be withdrawn.

For all the reasons advanced above, Applicant respectfully submits that the application is in condition for allowance and that action is earnestly solicited.

Respectfully submitted,

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